TWO-SIDED PLATFORMS AND ANALYSIS OF SINGLE-FIRM CONDUCT

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Recent work in economics has shown that many significant industries are based on "two-sided platforms" that enable distinct groups of customers to interact with each other and obtain the benefits of externalities between them.[1] These include old-economy industries such as advertising-supported media and new-economy industries such as those based on software platforms and web portals.

Pricing and other business strategies are strongly affected by the interdependencies between the two sides of the platform. As a matter of theory, for example, the profit maximizing prices may entail below-cost pricing to one set of customers over the long run and, as a matter of fact, many two-sided platforms charge one side prices that are below marginal cost and are in some cases negative.

Antitrust analysis of single-firm conduct—and, of course, all antitrust analysis—should be cognizant of the economics of two-sided platforms.[2] This paper provides a brief introduction to this topic.

Overview of Two-Sided Platforms

Two-sided platforms create value, and therefore secure profit opportunities, in the following circumstances. There are two distinct groups of customers. Members of one group need members of the other group to realize some value. Transactions costs impede these groups from getting together. A two-sided platform helps members of these two groups to come together and capture the externalities between them. As Rochet and Tirole put it, the relationship between platform users "must be fraught with residual externalities" that these users cannot sort out for themselves because of transactions costs.[3]

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[1] *See* David S. Evans & Richard Schmalensee, The Industrial Organization of Markets with Two-Sided Platforms in ISSUES IN COMPETITION LAW AND POLICY (Wayne D. Collins ed., forthcoming) for an overview of the literature. Platforms may serve more than two distinct groups of customers and in general can be "n"-sided. For simplicity this paper focuses on two-sided platforms which are the most common.

[2] *See* David S. Evans, The Antitrust Economics of Multi-Sided Platform Markets, 20 YALE J. REG. 325 (2003) and Julian Wright, One-Sided Logic in Two-Sided Markets, 3 REVIEW OF NETWORK ECONOMICS 44 (2004).

[3] Jean-Charles Rochet & Jean Tirole, Defining Two-Sided Markets (Working Paper, January, 2004). As Rochet and Tirole observe, a necessary condition for a market to be two-sided is that the Coase theorem does not apply to the transaction between the two sides. Generally, one can think of two-sided platforms as arising in situations in which there are externalities and in which transactions costs, broadly considered, prevent the two sides from solving this externality directly. The platform can be thought of as providing a technology for internalizing the externality in a way that minimizes transactions costs.

A singles club provides a trivial example. Men and women want to get together to meet each other. It is cheaper to do that in a venue that aggregates the two groups together and where members are there for the purpose of dating. Singles clubs help reduce transactions costs between the two sexes. It earns profits by providing the physical platform and for facilitating the interactions. On-line matchmaking, speed dating, and other businesses for getting men and women together serve similar purposes.

Two-sided platform businesses have to accommodate the interdependent interests of the two customers groups. The business must get both customer groups on the platform and in the right proportions. This feature has strong implications for pricing. The pricing structure—the *relative* prices charged to the customer groups—is an important feature. An increase in the price to side A reduces the number of A's that the platform can make available to members of side B and vice versa. The extent to which the platform recovers fixed and variable costs from each side has a material effect on the value of the platform to each side and the overall ability of the platform to secure a profit. The singles club again provides a trivial illustration. A club that charges women "too much" will not have enough women to make the club attractive to men.

Two-sided platforms were first identified in pioneering work by Jean-Charles Rochet and Jean Tirole which began circulating in 2001.[4] A significant theoretical and empirical literature quickly emerged and the subject remains an area of very active research in economics.[5] For the purposes of this paper, it is helpful to clarify some terminology that is used in the economics literature and which sometimes causes confusion.

Rochet and Tirole used the term "two-sided markets" to refer to situations in which businesses were catering to two interdependent groups of customers. The term "market" was meant loosely and does not refer to how that term is often used in antitrust. In fact, the decision to operate a two-sided platform is usually a matter of strategic choice rather than market necessity and two-sided businesses sometimes compete with one-sided businesses for customers. This paper refers to "two-sided platforms" but it is synonymous with "two-sided markets" as used in much of the economics literature.

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[4] Jean-Charles Rochet & Jean Tirole, Platform Competition in Two-Sided Markets, 1 JOURNAL OF EUROPEAN ECONOMICS ASSOCIATION 990 (2003).
[5] *See* http://idei.fr/doc/conf/tsm/programme.pdf for the program for a recent conference.

What "market" a two-sided platform competes in, from an antitrust perspective, is one of the questions considered here.

It turns out that many businesses in a wide variety of industries operate two-sided platforms. These include exchanges (auction houses, financial exchanges, insurance brokerage, travel services, and real estate multiple listing services); advertising-supported media (newspapers, magazines, free television, web portals); transaction systems (payment cards, travelers checks, internet money, cash, and checks); and software platforms (personal computers, video game consoles, digital media platforms). This list is not exhaustive. A detailed examination of all these businesses reveals that their pricing, design, and other business strategies are driven by getting multiple customer groups to interact on their platforms and that they create value primarily by reducing transactions or other costs.

Basic Economic Insights

To see the intuition behind pricing consider a platform that serves two customer groups A and B. It has already established prices to both groups and is considering changing them.[6] If it raises the price to members of group A fewer A's will join. If nothing else changed the relationship between price and the number of A 's would depend on the price elasticity of demand for A's. Since members of group B value the platform more if there are more A's fewer B's will join the platform at the current price for B's. That drop-off depends on the indirect network externality which is measured by the value that B's place on A's. But with fewer B's on the platform, A's also value the platform less leading to a further drop in their demand. There is a feedback loop between the two sides. Once this is taken into account the effect of an increase in price on one side is a decrease in demand on the first side because of the direct effect of the price elasticity of demand and on both sides as a result of the indirect effects from the externalities. The change in revenue from a change in price to A therefore depends on the price elasticity of demand for A's and the indirect network effects between the two

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[6] To keep matters simple we consider the case where each side is charged a membership fee as in Mark Armstrong, Competition in Two-Sided Markets (University College London Working Paper, November 2005). More generally, platforms are natural businesses for two-part tariffs involving an access fee and a usage fee.

sides. (Costs necessarily go down. As is always the case with profit maximization, the price increase is profitable if revenues do not decline more than costs decline.)

The platform, of course, would like to find the prices that maximize its profits by taking these same sorts of considerations into account. For a single-sided business that would occur by selecting the output at which marginal revenue equals marginal cost and then charging the corresponding price for this quantity from the demand curve. (This equilibrium is often described by the standard Lerner formula that says that the price-cost margin equals the inverse of the elasticity of demand.) For two-sided platforms three results appear to be robust:

- The optimal prices depend in a complex way on the price elasticities of demand on both sides; the nature and intensity of the indirect network effects between each side; and the marginal costs that result from changing output of each side.

- The profit-maximizing prices may be below the marginal cost of supply for that side or even negative.

- The relationship between price and cost is complex, and the simple formulas that have been derived by single-sided markets do not apply.

The empirical evidence shows that it is common for two-sided platforms to charge prices that either just cover side-specific costs (and therefore do not contribute to overall profitability given that these platforms often have significant fixed costs) or that provide services at below marginal cost.[7]

Horizontal differentiation can result in customers choosing to join and use several platforms—a phenomenon that Rochet and Tirole have called "multi-homing." Customers find certain features of different competing platforms attractive and therefore rely on several. Payment cards are an example of multi-homing on both sides. Most merchants accept credit and debit cards from several systems including ones that have relatively small shares of cardholders. Many cardholders carry multiple credit cards,

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[7] *See* David S. Evans, Some Empirical Aspects of Multi-Sided Platform Industries, 2 REVIEW OF NETWORK ECONOMICS 191 (2003), David S. Evans, Andrei Hagiu & Richard Schmalensee, INVISIBLE ENGINES: HOW SOFTWARE PLATFORMS DRIVE INNOVATION AND TRANSFORM INDUSTRIES (MIT Press, 2006), and Evans & Schmalensee, *supra* note 1.

although they may tend to use a favorite card most often.[8] Advertising-supported media also have multi-homing on both sides—advertisers and viewers rely on many differentiated platforms. Other two-sided platforms have multi-homing only on one side. Most end-users rely on a single software platform for their personal computers, for instance, while many developers write for several platforms.

Platforms have economies of scale on both the demand (the more customers on one side the more valuable it is to customers on the other) and cost sides (there are often fixed costs of operating a platform). One might expect that two-sided platforms would tend to have monopolies. Several factors work against this outcome. First, heterogeneous preferences by customers on either side encourage platform differentiation. Second, heterogeneous preferences, platform differentiation, low switching costs and other factors result in multi-homing which provides demand for several platforms by one or more customer sides. Third, congestion—especially in platforms in which search is important—tends to limit the advantages of scale. As an empirical matter, in many industries multiple platforms compete with each other and there does not appear to be evidence of tipping towards monopoly.[9]

The economics literature on two-sided platforms has predecessors, of course. Some of the basic insights were made by William Baxter in his paper on pricing for payment card systems.[10] Likewise, the literature on advertising-supported media and market microstructure recognize some of the issues examined in the new two-sided literature. A central feature of two-sided platforms—indirect network effects—was the subject of a mainly theoretical literature that began in the mid 1980s.[11] The major contributions of the two-sided literature have been to focus on the role of intermediaries in internalizing externalities, to develop a general framework for understanding these intermediaries, documenting their pervasiveness, and assessing empirical regularities.

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[8] Marc Rysman, An Empirical Analysis of Payment Card Usage, JOURNAL OF INDUSTRIAL ECONOMICS (forthcoming 2006).
[9] *See* Evans & Schmalensee, *supra* note 1.
[10] William F. Baxter, Bank Exchange of Transactional Paper: Legal and Economic Perspectives, 26 J.L. & ECON. 541 (1983).
[11] Michael Katz & Carl Shapiro, Systems Competition and Network Effects, 8 JOURNAL OF ECONOMIC PERSPECTIVES 93 (1994).

Product Design

Two-sided platforms are designed to maximize the overall value of the platform taking into account its interdependent appeal to both sides.[15] That has implications for analyzing predatory design and tying matters. Practices that look as if they do not make business sense from a one-sided perspective may from a two-sided one. The platform may impose requirements on side *A* that do not benefit them directly and which customers on that side might even reject after comparing private benefits and costs. But such requirements may benefit side *B*. And if the demand increases on side *B*, these requirements may increase the value placed on the platform on side *A*—and in fact could increase value so much that the feature provides a net benefit to side *A*.[16]

Shopping malls are a familiar example. Many are not designed to minimize travel time (and therefore transactions costs) for shoppers but to maximize the number of stores the shopper has to walk by. For example, the up and down escalators might be at opposite ends of a two-level mall. Advertising-supported media is another familiar example. Newspapers, magazines, and television platforms are usually designed to maximize the chances that viewers will interact with the advertisements. Magazines are often laid out to make it difficult to even find the table of contents or to find the continuation of an article without thumbing through many advertisements. Free television often intersperses the advertisements and precede them perhaps with a cliffhanger to discourage viewers from taking a long break. In both cases, the platform imposes costs on one side because it increases value to the other side.

Two-sided platforms may also bundle features that directly benefit side *A* but harm side *B* (putting aside the indirect externalities from increasing the participation of side *A*).[17] The honor-all-cards rule for payment cards is a possible example. Card systems generally require that merchants that agree to take the system's branded cards,

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can use revenue from third side to lower price on high-price side for the two-sided firm. That can also happen when a two-sided firm challenges a single-sided firm. If the two-sided firm's low-price side is the same as the single-sided firm's product then the latter will run into trouble. In some cases such strategies that destroy a competitor could be predatory; whether they could be reliably identified as such is a different matter.

[15] These design decisions seem common on pretty competitive markets; whether they maximize social welfare is an interesting area for theoretical inquiry.

[16] See Jean-Charles Rochet & Jean Tirole, Tying in Two-Sided Markets and the Impact of the Honor All Cards Rule (Working Paper, March 2004).

[17] *See* Rochet and Tirole (2004), *supra* note 16.

agree to take all branded cards that are presented by shoppers. Thus, merchants that have a contract to take American Express cards cannot decide to take payment by Amex corporate cards but not Amex personal cards, or to take payment from one-time customers but not from repeat customers. For at least some merchants the private benefit of this requirement outweighs its cost (generally we would expect that merchants would privately want a choice to take whatever card they wanted). However, this rule makes the system's branded card more valuable to its cardholders, who have the assurance that their card will be accepted for payment at merchants that display the system's acceptance mark. By increasing the number of cardholders it makes the card a more valuable payment device for merchants to accept.[18]

Concluding Remarks

Two-sided platforms typically involve complex business arrangements and engage in practices that seem unusual when considered from the perspective of traditional one-sided businesses. There is no general reason, at least at this point in the literature, to believe that two-sided platforms are more or less likely than other businesses to engage in anticompetitive practices. When two-sided platforms are the subject of antitrust analysis, proper analysis should consider the implications of two-sidedness for evaluating market definition, for assessing market power, for considering efficiencies, and for assessing anticompetitive effects.

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[18] Some work suggests that two-sided platforms may use exclusive contracts to exclude competitors. Suppose one customer group single homes (that is uses only one platform) while the other group multi-homes (uses several platforms). With significant indirect network effects (and no congestion) this will tend to drive all customers towards a single platform. See Mark Armstrong & Julian Wright, Two-Sided Markets, Competitive Bottlenecks and Exclusive Contracts (Working Paper, November 2004). Of course, as with all exclusive dealing theories this result depends on quite specific assumptions and ignores possible efficiencies from exclusive contracts.